

1 AIR NOZZLE AND RELIEF VALVE ARRANGEMENT FOR VERTICAL 2 TIRE PUMP

4 BACKGROUND OF THE INVENTION

5 1. Field of the Invention

6 The present invention relates to a vertical tire pump and, more
7 specifically, to an air nozzle and relief valve arrangement for use in a vertical
8 tire pump.

9 2. Description of the Related Art

10 FIG. 7 shows a conventional vertical tire pump, which was invented by
11 the present inventor. This structure of vertical tire pump **1** has an inner tube **4**
12 mounted inside the plunger tube **6** and connected to the handle **8**, and a relief
13 valve **7** mounted in the top end of the inner tube **4** inside the handle **8**. Through
14 the relief valve **7** the user can discharge excessive air pressure out of the
15 inflatable body. If the user does not have a pressure gage, or does not know the
16 standard pressure of the inflatable body, the user may press the inflatable body
17 **10** with the fingers to check the internal pressure status of the inflatable body. If
18 the internal pressure of the inflatable body is excessively high, the user can then
19 open the relief valve **7** to discharge excessive air pressure out of the inflatable
20 body. However, because the relief valve **7** is disposed in the handle **8** of the
21 vertical tire pump **1** far away from the inflatable body, the user must move the
22 hand through a long distance from the inflatable body to the relief valve **7** at the
23 handle **8**, and then open the relief valve **7** to discharge air. Due to a long distance
24 between the inflatable body and the relief valve, a delay error may occur when
25 discharging excessive air pressure out of the inflatable body, resulting in an

1 accurate discharge. Further, if the relief valve failed, the user can not replace the
2 relief valve by one self, and must ask a professional person to do the job or
3 replace the whole vertical tire pump. The repair cost according to this design is
4 high. Further, because this design is not a DIY (Do-It-Yourself) design, the user
5 cannot install or dismount the relief valve by one self.

6 Therefore, it is desirable to provide an air nozzle and relief valve
7 arrangement that eliminates the aforesaid drawbacks.

8 **SUMMARY OF THE INVENTION**

9 The present invention has been accomplished under the circumstances
10 in view. It is the main object of the present invention to provide an air nozzle
11 and relief valve arrangement, which enables the user to operate the relief valve
12 to discharge excessive air pressure from the inflatable body efficiently and
13 accurately with less effort. It is another object of the present invention to
14 provide an air nozzle and relief valve arrangement, which enables the user to
15 replace the relief valve by oneself when the relief valve failed, saving the repair
16 cost. To achieve these and other objects of the present invention, the air nozzle
17 and relief valve arrangement comprises an air nozzle, and a relief valve installed
18 in the air valve. The air nozzle has a first end, a second end connected the air
19 output hose of a vertical tire pump, an air passage extended between the first
20 end and the second end, a filling plug assembly mounted in the first end, and a
21 lever coupled to the filling plug assembly for operation by the user to move the
22 filling plug assembly between an open position for enabling air to pass from the
23 air passage to the inflatable body being connected to the first end and a close
24 position to block said air passage. The relief valve is mounted in the air nozzle
25 in air communication with the air passage, and selectively controlled to

1 discharge air out of the air passage into the atmosphere. Because the relief valve
2 is installed in the air nozzle, the user can conveniently efficiently operate the
3 relief valve with the same hand after checking the pressure status of the
4 inflatable body. Further, the simple structure design enables the user to remove
5 the relief valve from the air nozzle conveniently by one self for a replacement
6 when the relief valve failed.

7 Other objects, advantages and features of the present invention will
8 now be described by way of example with the annexed drawings.

9 **BRIEF DESCRIPTION OF THE DRAWINGS**

10 FIG. 1 is a perspective view showing an air nozzle and relief valve
11 arrangement installed in a vertical tire pump according to the present invention.

12 FIG. 2 is an exploded view of the preferred embodiment of the present
13 invention.

14 FIG. 3 is a sectional view taken along line 3-3 of FIG. 1.

15 FIG. 4 is a sectional view showing an operation status of the present
16 invention.

17 FIG. 5 is an enlarged view of a part of FIG. 4, showing the closed status
18 of the relief valve.

19 FIG. 6 is similar to FIG. 5 but showing the relief valve opened.

20 FIG. 7 is a sectional view of a vertical tire pump according to the prior
21 art.

22 **DETAILED DESCRIPTION OF THE INVENTION**

23 Referring to FIG. 1, an air nozzle **10** is mounted with a relief valve **20**,
24 and connected to the hose **31** of a vertical tire pump **30**.

25 Referring to FIGS. 2 and 3, the air nozzle **10** has a first end **11**, a

1 second end **12**, an air passage **15** extended from the first end **11** to the second
2 end **12**, a filling plug assembly **13** mounted in the first end **11** and connectable
3 to a US model air valve or French model air valve, and a lever **14** coupled to the
4 first end **11** and adapted to control the filling plug assembly **13** and to further
5 close/open the air passage **15**. Because the filling plug assembly **13** is of the
6 known art, no further detailed description in this regard is necessary. The second
7 end **12** is coupled to the hose **31** of the vertical tire pump **30** for enabling
8 pumped air to pass from the vertical tire pump **30** through the hose **31** into the
9 internal air passage **15** of the air nozzle **10**. The air nozzle **10** further has a first
10 through hole **16** and a second through hole **17** respectively vertically disposed in
11 communication with the air passage **15**.

12 The relief valve **20** comprises a valve rod **21**, a valve cap **22**, and a
13 spring member **23** provided between the stem washer **22** and the valve rod **21**.
14 The valve rod **21** has a first end **211** and a second end **212**. The first end **211** is
15 inserted through the first through hole **16** to the outside of the air nozzle **10**. The
16 outer diameter of the valve rod **21** is slightly smaller than the first through hole
17 **16**, leaving a gap. The first end **211** of the valve rod **21** has an outer thread **213**
18 around the tip, which is threaded into the inner thread **241** of a button **24** that is
19 disposed outside the air nozzle **10** for pressing by the user. The second end **212**
20 of the valve rod **21** has a flange **214** extended around the periphery. An O-ring
21 **25** is mounted on the first end **211** of the valve rod **21**, and stopped between the
22 flange **214** and the shoulder **161** of the first through hole **16**. The valve cap **22**
23 has an outer thread **221** threaded into an inner thread **171** inside the second
24 through hole **17**. An O-ring **26** is mounted on the valve cap **22**, and stopped
25 between the valve cap **22** and the shoulder **171** of the second through hole **17**.

1 The valve cap **22** has a center recessed hole **222** adapted to accommodate one
2 end of the spring member **23**. The other end of the spring member **23** is sleeved
3 onto the second end **212** of the valve rod **21** and stopped against the flange **214**.
4 The valve cap **22** further has a bottom tool hole **223** adapted to receive a tool
5 that is used to rotate the valve cap **22**.

6 Referring to FIG. 3 again, normally, the relief valve **20** is closed, and
7 the air passage **15** of the air nozzle **10** is not in communication with the
8 atmosphere. As illustrated, the relief valve **20** is provided below the lever **14**,
9 which protects the relief valve **20** against outside dust.

10 Referring to FIGS. 4 and 5, before pumping operation, the lever **14** is
11 lifted to open the filling plug assembly **13** to let the air passage **15** be in air
12 communication with the inside space of the inflatable body (tire) **40** to be
13 inflated. At this time, the air pressure of the air passage **15** is equal to the inside
14 pressure of the inflatable body (tire) **40**. If the tire pump is not equipped with a
15 pressure gage, the user may press the inflatable body (tire) **40** with the fingers to
16 check the internal pressure status of the inflatable body (tire) **40** during pumping
17 operation.

18 Referring to FIG. 6, if the user feels that the air pressure of the
19 inflatable body (tire) **40** is too high (a hard touch is sensed) after pressed the
20 inflatable body (tire) **40** with the fingers, the user can then use the same hand to
21 press the button **24**, causing the relief valve **20** to discharge air. Because the
22 relief valve **20** is installed in the air nozzle **10**, which is connected to the
23 inflatable body (tire) **40**, the user can conveniently rapidly check the pressure
24 status of the inflatable body (tire) **40** with the fingers and the press the button **24**
25 to open the relief valve **20** with the same hand when necessary. When the user

1 pressed the button **24** with the hand, the valve rod **21** is lowered to move the
2 respective O-ring **25** away from the shoulder **161** of the first through hole **16**,
3 for enabling air to rapidly pass out of the inflatable body **40** to the atmosphere to
4 lower the internal air pressure of the inflatable body (tire) **40**.

5 More important, because the relief valve **20** is installed in the air
6 nozzle **10**, the short distance between the relief valve **20** and the inflatable body
7 (tire) **40** enables air to be quickly and accurately discharged out of the inflatable
8 body (tire) **40**. When the relief valve **20** failed, the user can directly remove the
9 air nozzle **10** from the tire pump **30** for a replacement without throwing the
10 whole tire pump **30** away. This DIY (Do-It-Yourself) design enables the user to
11 make the replacement by oneself without the help of a professional person,
12 thereby reducing the repair cost.

13 A prototype of air nozzle and relief valve arrangement for vertical tire
14 pump has been constructed with the features of FIGS. 1~6. The air nozzle and
15 relief valve arrangement for vertical tire pump functions smoothly to provide all
16 of the features discussed earlier.

17 Although a particular embodiment of the invention has been described
18 in detail for purposes of illustration, various modifications and enhancements
19 may be made without departing from the spirit and scope of the invention.
20 Accordingly, the invention is not to be limited except as by the appended claims.